FINAL PLAN OF REMEDIAL ACTION

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CHRISTINA RIVER PEDESTRIAN WALKWAY
Phases III & IV
Wilmington, Delaware

DNREC Project No. DE-1139

August 1999

Department of Natural Resources and Environmental Control
Division of Air and Waste Management
Site Investigation and Restoration Branch

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SITE STATUS
DATA BASE

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I INTRODUCTION

As part of the redevelopment of the Christina Riverfront Area in Wilmington, Delaware a walkway is planned to be constructed to provide additional pedestrian access to improvements to the Christina River. This proposed Plan of Remedial Action covers Phases III and IV of the Walkway Project. The Project area is defined by 'figure 3'. Proposed Conditions Plan prepared by Rummel, Kelpper & Kahl, LLP April 12, 1999. The outer sediment limit of the project area is the low water limits identified in Figure 3. The upland extent of the project is defined by the dash line on Figure 3. Phases III & IV of the walkway will extend from the Tubman-Garrett Riverfront Park at Market Street to the Delaware Transit Corporation. The approximate distance of this portion of the walkway is 1,750 feet.

Because of past industrial uses in the Christina Riverfront Area the soil and riverbank sediment have been impacted by a variety of industrial residues, including petroleum hydrocarbons, other organic compounds and metals. The Riverfront Development Corporation (RDC) entered into a Voluntary Cleanup Program (VCP) Agreement with the Department of Natural Resources and Environmental Control's Site Investigation and Restoration Branch (DNREC-SIRB). The purposes of the VCP Agreement were to:

1. Identify potential sources of contamination within the improvement area.

2. Develop remedial alternatives for the detected contamination that would protect human health and the environment during and after construction of the walkway.

To accomplish these purposes EA Engineering, Science, and Technology, Inc. was contracted by the RDC to perform soil drilling, sampling and analysis in and along the planned walkway and river bank to characterize the existing levels of contaminants from past industrial practices. The collection and analysis of these soil samples were performed in accordance with the Hazardous Substance Cleanup Act ("HSCA"), the Delaware Regulations Governing Hazardous Substance Cleanup ("Regulations"), Delaware Standard Operating Procedures for Chemical Analytical Programs (SOPCAP), guidance documents, and other DNREC policies and procedures.

II PURPOSE

This document is the Department's Final Plan of Remedial Action for the site. It is based on the technical reports of sampling and the Remedial Investigation/Feasibility Study and the Proposed Plan of Remedial Action, which was issued under the provisions of HSCA and the Regulations. The Final Plan presents the Department's assessment of human health and environmental risks associated with the site.

The Department provided public notice and opportunity to comment on the Proposed Plan of Remedial Action in accordance with Section 12 of the Regulations. At the conclusion of the comment period, the Department reviewed and considered of the comments received and issues this Final Plan of Remedial Action which designates the remedial action and the selected procedures and stipulations concerning future activities within the site. The Proposed Plan of

Remedial Action, the comments received from the public, the Department's response to the comments, the Final Plan of Remedial Action, and all of the documents which formed the basis for the Proposed and Final Plans of Remedial Action will constitute the "Remedial Decision Record."

III SITE DESCRIPTION AND HISTORY

Site Location

The project area is located in the South Wilmington area adjacent to the northwest side of the Christina River. It extends from the Tubman-Garrett Riverfront Park at Market Street to the Delaware Transit Corporation. The approximate distance of this portion of the walkway is 1,750 feet.

Site History

Based on a review of historical directories, maps, existing environmental reports and interviews, several possible sources of historic contamination were identified on the subject property and in the immediate vicinity of the site. These include the Harlan & Hollingsworth shipyard and the Gates Engineering property.

The area of the improvements was historically the site of shipbuilding and other heavy industrial activities. Much of the area was initially marshland that had been filled with slag and other industrial waste products. Because of its previous industrial use, much of the soil in the area has been impacted by environmental contaminants, including total petroleum hydrocarbons (TPH), heavy metals (i.e., lead, arsenic), polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs).

IV INVESTIGATION RESULTS

The Remedial Investigation included surface soil, subsurface soil, groundwater, and sediment sampling. The sample collection was performed in a phased approach that was integrated into engineering assessments being conducted for the improvements.

The findings of the environmental investigation showed that all media (soil, sediment and groundwater) were impacted above DNREC-SIRB Uniform Risk Based Remediation Standards (URS) for unrestricted use surface and subsurface soil, and URS values for protection of the environment for sediment. The contaminants included metals (particularly lead and arsenic), PCBs, PAHs and volatile organic compounds (VOC)s.

The potential exposure pathways evaluated were air, contact with soil, groundwater and surface water. The receptors considered were on-site workers during construction and the general public. Ecological risks posed to the Christina River were also considered.

The information gathered during the environmental investigations was used to develop this Proposed Plan of Remedial Action.

V REMEDIAL ACTION OBJECTIVES

According to HSCA regulation 8.4(1), during a remedial investigation, remedial action objectives must be established. For the Christina River Pedestrian Walkway Phases III & IV, remedial action objectives were designed based on the following factors:

- The site is currently in an area zoned as commercial and industrial land and numerous vacant lots and former industrial buildings are adjacent to the site.
- The future site use is to be a walkway and meeting place similar to a park.
- The site is adjacent to the Christina River.
- Soil and riverbank sediment at the site have been impacted by various chemical constituents. Based on the nature and extent of the contaminants, arsenic, lead, PAHs, PCBs and VOCs have been chosen as the primary contaminants of concern.
- The groundwater media has been impacted by PAH's, VOC's, and petroleum compounds.
- The primary exposure pathways are air inhalation, direct contact and incidental ingestion with/of impacted soil and erosional transport to the Christina River.
- The major risk associated with the site is potential human contact with impacted soil and ecological risks to the river system.

Qualitative Remedial Objectives

Based on the above factors, the following qualitative remedial action objectives were developed:

- Control potential human contact (dermal and ingestion) with contaminated soil.
- Control potential contaminated soil erosion to the Christina River.
- Remove any highly contaminated material (Category Z in the reuse decision criteria) prior to or during construction.
- Mitigate erosion and release of contaminated soil and riverbank, and sediment groundwater discharge to the Christina River to protect aquatic biota.

Quantitative Remedial Objectives

Based on the above qualitative remedial action objective, the following quantitative remedial action objectives were developed:

- Prevent human contact with soil having an arsenic concentration greater than 3 mg/Kg.
- Prevent human contact with soil having a lead concentration greater than 400 mg/Kg.
- Prevent human contact with soil having a PAH concentration greater than 1 mg/Kg.
- Prevent human contact with soil having a PCB concentration greater than 0.5 mg/Kg.
- Prevent human contact with groundwater having concentrations over respective Safe Drinking Water Act Maximum Contaminant Levels (MCLs).
- Prevent aquatic biota contact with contaminated riverbank sediment above DNREC-SIRB URS values for the protection of the environment.
- Prevent discharge of groundwater contaminants to surface water in excess of the Delaware surface Water Quality Standards.
- Prevent human contact with contaminated groundwater in excess of DNREC-SIRB values for protection of human health.

The quantitative remedial action objectives are based on the DNREC "Remediation Standards Guidance Under the Delaware Hazardous Substance Cleanup Act" (February 1998) and Soil Reuse criteria developed by DNREC-SIRB for use at the adjacent West Street Connector project. These objectives are protective of potential human and environmental receptors including surface water and groundwater.

VI PROPOSED REMEDIAL ACTION PLAN

The proposed remedial actions were based upon the Remedial Action Objectives.

Potential Remedial Alternatives

To accomplish the described remedial action objectives, three (3) potential remedial alternatives were reviewed. These are listed below and discussed further in the following section:

1. No Further Action of an environmental nature; whether or not the walkway is constructed.
2. Combination of removal and disposal of contaminated soil and riverbank sediments and containment remedies.

3. Complete removal of contaminated soils and riverbank sediment and reconstruct riverbank.

Alternative 1: No Further Action.

Under this alternative no additional environmental action would be taken. The contaminated materials would remain in their current condition. The walkway would be constructed without any remedy of contaminated soil or riverbank sediment.

Alternative 2: Combination of removal and disposal of contaminated soil and riverbank sediments and containment remedies.

This option involves containing and selected removal of soil and riverbank sediment to prevent: 1) migration of the contaminants to areas around the construction and to the Christina River, and; 2) the exposure of the contaminants to the public.

Under this alternative soil to be excavated will be handled in accordance with the DNREC-SIRB Riverbank Sediment/Soil Re-Use Levels (Table 1). Based on the laboratory analysis of environmental media samples, the soil and riverbank sediment will be placed into one of four categories for either selective reuse during the transportation project or for testing and off-site disposal at an appropriate facility. These categories of possible soil and riverbank sediment reuse have been developed by DNREC-SIRB to be protective of public health, welfare and the environment based upon land use and/or the need to either remove and dispose of soil/riverbank sediment or effectively engineer an acceptable containment of the contaminated material. The categories of soil and riverbank sediment reuse begin with unlimited use (i.e., uncontaminated) to no reuse (highly contaminated sediment and/or soil for off-site disposal). These categories include:

A - Unlimited Contractor re-use Outside of Riverfront Redevelopment Area. (This category has low or no concentration of contaminants which are at levels suitable for unrestricted residential use).

B - Construction Re-use within Walkway Project and covered with a minimum of Amoco ACF 4508 fabric or equivalent as determined by DNREC and a minimum of one foot of fill over soil. Riverbank sediments will be covered with the DNREC approved fabric and clean fill or stone as described in the approved sub-aqueous lands permit and erosion control permits, as applicable.

C - Re-use Limited to under the planned Walkway.

Z - Off-Site Treatment or Disposal (i.e., Highly contaminated).

In addition to the soil/riverbank sediment reuse restriction identified above, the Christina River bank will be stabilized by a combination of upland storm water controls, marsh plantings, geotextile and stone. Deleterious debris will be removed prior to stabilization. Figure 3 from Section 7.2.2 of the report "Remedial Investigation/Feasibility Study, Christina River Pedestrian

Walkway, Berger Building to Delaware Transit Center, Wilmington, Delaware" dated May, 1999 by EA Engineering, Science, and Technology, Inc. is incorporated by reference to demarcate areas requiring remediation.

A deed restriction will be placed on the property indicating the project area is limited to non-residential use. This project area is located in an area that will have a regional Groundwater Management Zone (GMZ) established to preclude the installations of wells for potable water usage. In addition to the GMZ, the DNREC shall require all free product petroleum and/or any contaminant in the groundwater with a risk-based concentration value in excess of 1×10^{-5} cancer risk be extracted and treated to DNREC URS standards for protection of human health. The RDC shall provide sufficient space in their Remedial Action Plan to implement this activity.

DNREC-SIRB will require an Operations and Maintenance (O&M) Plan to be developed for the containment and the groundwater management portion of this remedy.

Alternative 3: Complete removal of contaminated soils and riverbank sediment and reconstruct the riverbank.

Under this alternative all contaminated soil and riverbank sediment would be excavated, removed, tested and disposed at appropriate off-site facilities. With this approach approximately 9,000 cubic meters of excavated soil and riverbank sediment material would be transported for off-site disposal and an equal amount of clean fill would be transported back for use in constructing the area prior to commencing with the walkway project. Also the riverbank stabilization and groundwater treatment requirements will be implemented as identified in Alternative 2. This project area is located in an area that will have a regional Groundwater Management Zone (GMZ) established to preclude the installations of wells for potable water usage.

VII EVALUATION OF REMEDIAL ALTERNATIVES

The remedial alternatives were evaluated in accordance with the criteria set forth in the Regulations. The applicability of these criteria are as follows;

Protection of public health, welfare and the environment - Alternative 1 does not protect public health, welfare and the environment. Alternatives 2 and 3 provide protection of public health, welfare and the environment.

Compliance with all applicable local, state and federal laws - Alternatives 2 and 3 can comply with all applicable local, state and federal laws. Alternative 1 does not comply with all applicable local, state and federal laws.

Community acceptance - Alternatives 2 and 3 are anticipated to be most acceptable to the community. Alternative 1 is not anticipated to be acceptable to the community. These criteria will be fully evaluated during the public comment period.

Monitoring required - Alternatives 1 and 2 would require minimal monitoring and maintenance. Alternative 3 would not require monitoring.

Technical practicability - Alternatives 1, 2 and 3 are technically practicable; although engineering controls will be extensive for Alternative 3.

Restoration time frame - Alternative 1 will have no restoration time. Alternative 2 will take 6 months to implement during the walkway construction. Alternative 3 will take 1.5 years to complete.

Reduction in toxicity, mobility and volume - Alternative 1 will not reduce toxicity, mobility or volume. Alternative 2 would effectively reduce the mobility and volume of the contaminated soil in the project area. Alternative 3 would reduce toxicity, mobility or volume of the contaminated material.

Cost of Implementation - There is no cost to implement Alternative 1. Alternative 2 will cost approximately $4.7 million to implement (including the cost of the walkway). Alternative 3 will cost approximately $7.7 million to implement.

Long term effectiveness - Alternatives 2 and 3 are effective in protecting public health, welfare and the environment over a long term period. Alternative 1 does not offer protection.

Short term effectiveness - Alternatives 2 and 3 are effective in protecting public health, welfare and the environment in the short term. Alternative 1 does not offer protection.

VIII FINAL PLAN OF REMEDIAL ACTION

Alternative 2 will provide the protection DNREC requires and can be implemented during the construction of the walkway. This alternative also is a cost-effective means of meeting all the remedial objectives while satisfying the evaluation criteria.

IX PUBLIC PARTICIPATION

The Department solicited public comments or suggestions on the Proposed Plan of Remedial Action in a form of a twenty-day comment period and a public hearing held on August 25, 1999.

The comment period began Thursday, August 5, 1999 and ended Thursday, August 26, 1999. Comments were received and are addressed in the Public Hearing Memorandum.

X DECLARATION

This Final Plan of Remedial Action for the Christina River Pedestrian Walkway site is protective of human health, welfare and the environment and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act.

_____ _____

William W. Hill Date
Acting Director, Division of Air and Waste Management

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Table 1
Riverbank Sediment/Soil Re-Use Levels for Christina River Pedestrian Walkway Project
Phase III & IV
(Concentrations in mg/Kg)

Riverbank Sediment/Soil Category	**A**	**B***	**C**	**Z**
Contaminant of Concern	Unlimited Contractor Re-Use	Construction Re-Use within Project Area	Re-Use Limited to Under Foundations of Building in Project Area	Off-Site Treatment of Disposal
Oily Soil or Free Product	none	none	none	Yes
Petroleum Hydrocarbons				**
C5 through C8 aliphatic hydrocarbons	100	500	500	
C9 through C12 Aliphatic hydrocarbons	1000	2500	2500	
C19 through C18 Aliphatic hydrocarbons	1000	2500	2500	
C19 through C36 Aliphatic hydrocarbons	2500	5000	5000	
C9 through C10 Aromatic hydrocarbons	100	500	500	
BTEX	<10	10 to 25	25 to 100	>100
C PAHs	<1	1 to 25	25 to 300	>300
PCBs	<0.5	0.5 to 3	3 to 8	>8
Arsenic	<3	60 to 100	100 to 500	>500
Lead	<400	400 to 1,500	1,500 to 5,500	>5,000

*Requires a Geotextile marker Fabric of a minimum quality of Amoco ACF 4508 or equivalent as determined by DNREC and a minimum on one foot fill over contaminated soil.

**Above 5,000 ppm for total TPH in soil.

Christina River Pedestrian Walkway

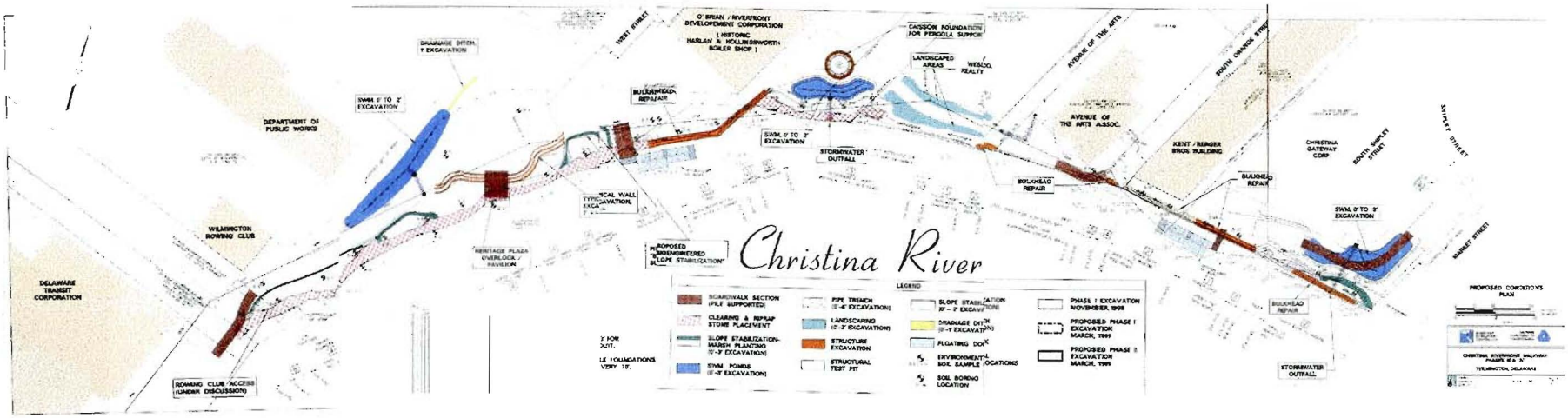

Figure 3 - Project Area